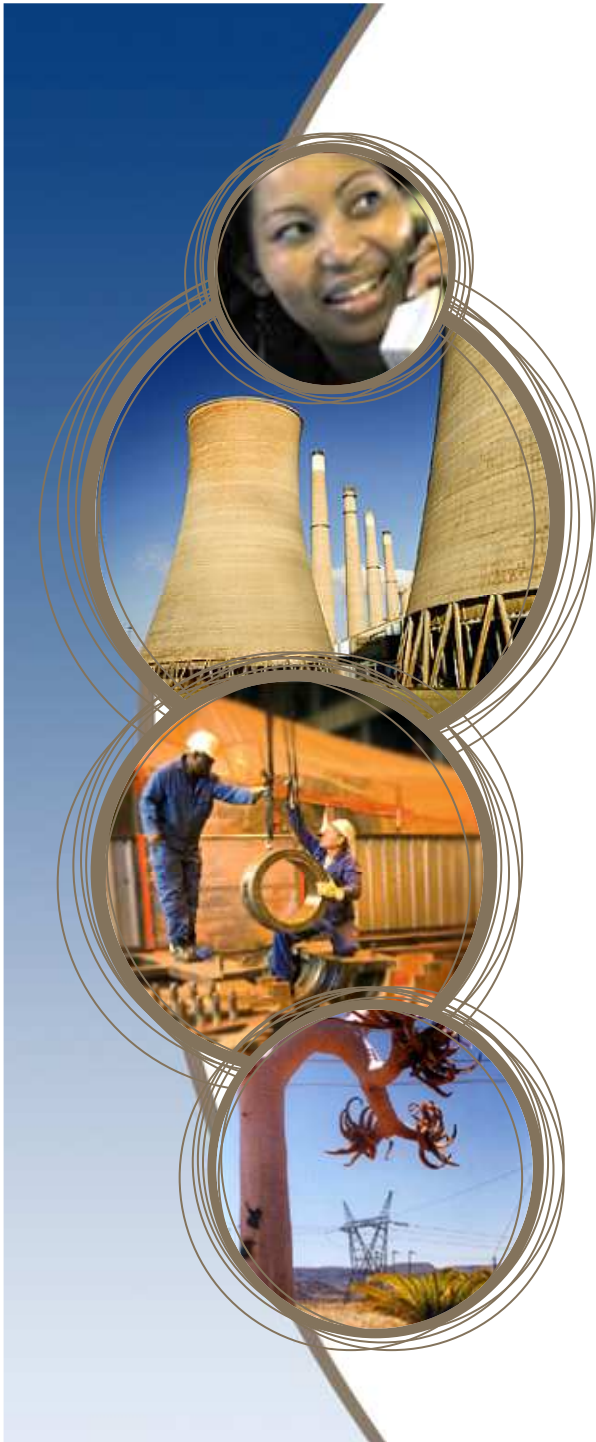


Wheeling/offset of energy

The Eskom approach

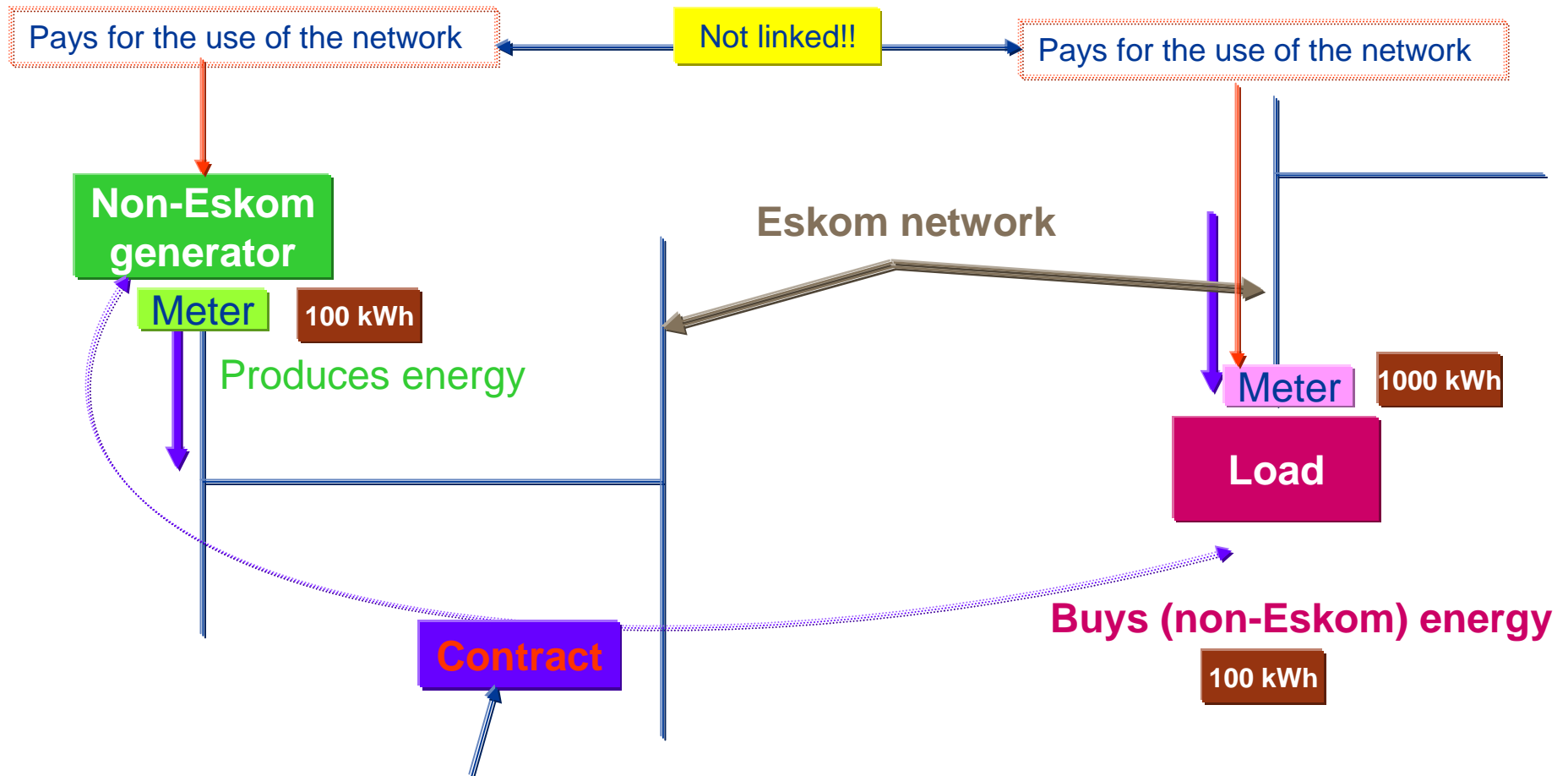
30 March 2011



- Generators have the same non-discriminatory rights of access to the network as a load
 - In the Code, Licence and ERA.
- Non-Eskom generators and Eskom generators are treated equally regarding access
 - However generators have to be licensed to generate and trade before access can be provided
- Generators and loads are both customers of the network provider
- Loads pay published and approved charges for the use of the network
 - These may be explicit unbundled charges or not!
- There is currently no regulated framework for use-of-system charges for embedded generators (generators connected to the Distribution network)
 - Submitted to NERSA
- Some of these generators may sell to Eskom through approved power purchase agreements, whilst others may wish to wheel energy to third parties.
- Generators that wish to wheel energy face a number of challenges related to the use-of-system charges.
- This presentation sets out the background on wheeling within the boundaries of South Africa

What is wheeling of energy?

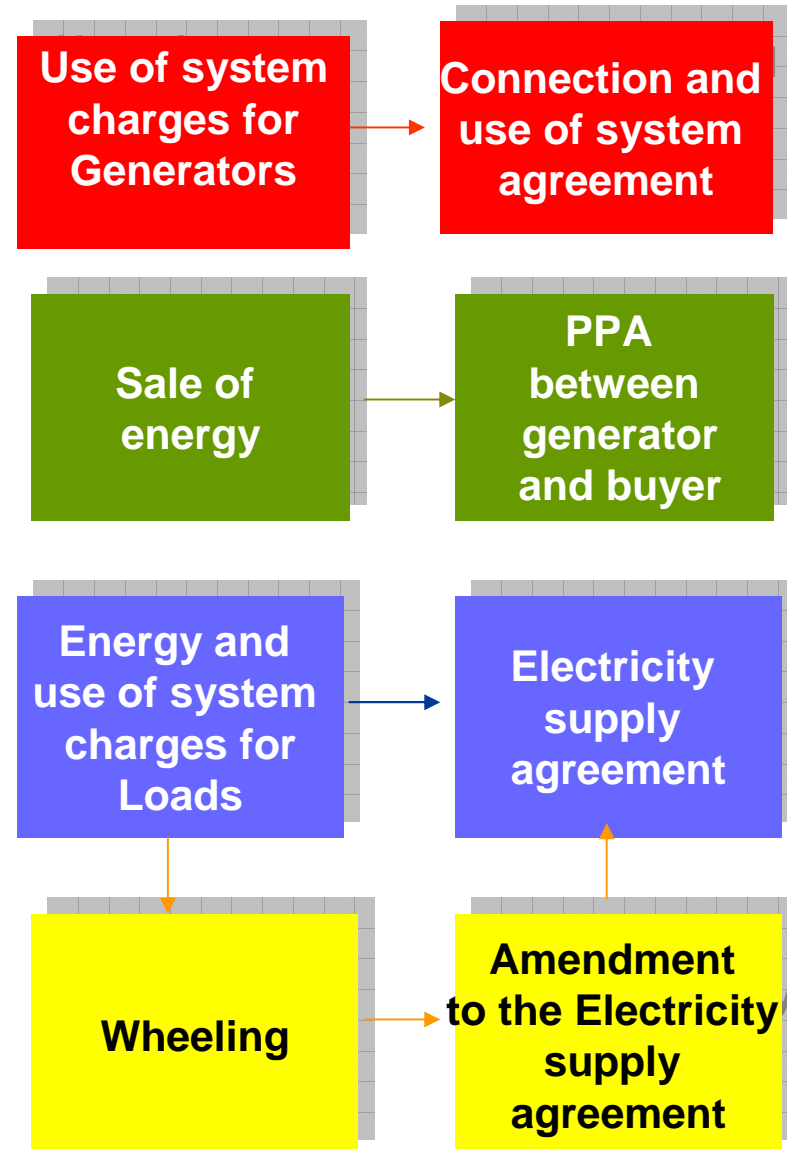
Its providing access between a non-Eskom Generator (NEG) and a third party to facilitate the trading of energy



Deals with a financial flow of energy – not actual flow

Transactions with generators

- The generator will contract with the network provider to provide network services. The network provider will raise charges for these services.
- The generator will contract with the entity purchasing the energy through a PPA and this may be with Eskom, a third party or for own generation.
- If the energy is sold to a third party, the electricity bill must be adjusted for the wheeled energy through a supplementary contract. The customer will pay the standard tariffs associated with the cost of delivering the energy.
- All of the above transactions are separate contracts and deal with different issues.



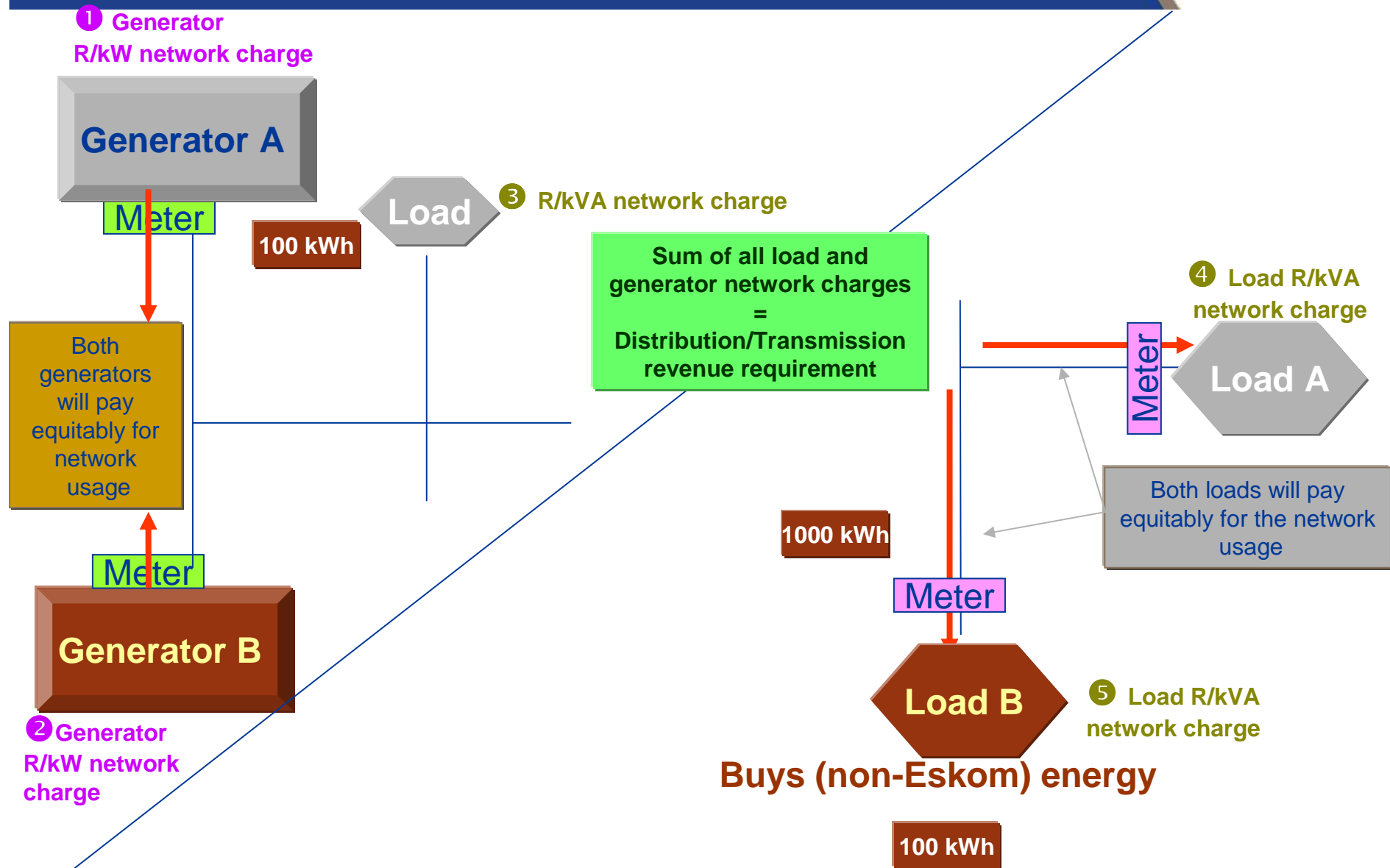
Conditions for providing wheeling

- Eskom will allow wheeling of energy subject to conditions.....
- Wheeling subject to NERSA approvals
 - Licensing, registration etc
- Connection subject to NERSA approvals and signing of a connection and use of system agreement
- The account(s) will be adjusted in terms of Eskom's policy on the reconciliation of accounts
- The third party access will be implemented initially up to an overall limit of 300 MW and the capacity of a NEG will not exceed 300 MW (currently being revised).
- A generator will not connect at low-voltage (<1 kV)

“Wheeling” charges

- “Wheeling charges” are not something special or different – they are the standard network related tariff charges for the use of the network
- There is no link made in the network charges between what the generator produces and what the load buys - the charges payable for the use of the network are NOT dependant on who supplies the energy
 - The generator is charged for what is exported - at standard GUOS tariffs
 - The load is charged for what is delivered over the Eskom network - at standard tariffs
 - Any use-of-system benefit or cost associated with a generator’s location accrues to that generator and not to the purchaser of the energy – as per the GUOS framework
- A customer receiving wheeled energy will pay the same tariff charges for the use of the network as a customer that purchases all its energy from Eskom i.e. no discrimination
- These charges comprise network charges, the cost of losses, reliability services and for loads the associated levies
 - Contribution to socio-economic subsidies will not be avoided by a wheeling arrangement
- There is no “credit’ given for network related charges – in particular network demand charges
 - The network demand charges recover only network related costs– not any energy costs
 - Some costs are recovered as energy based charges, but they are not related to energy cost (like the ERS)
- A wheeling arrangement does not reduce the capacity required on the network!

Use of system charges - allocation of network charges between loads and generators



Charges payable by loads

Loads	
+ Connection charges	Transmission Distribution
+ Network charges	Transmission Distribution
+ Losses	Transmission Distribution
+ Reliability services	System ops
+ Electrification and rural subsidy	Distribution
+ Service and admin charges	Transmission Distribution

Charges payable by **generators**

Generators

Transmission
Distribution + Connection charges

Transmission
Distribution + Network charges

Transmission
Distribution + /- Losses

System ops + Reliability services

Transmission
Distribution + Service and admin charges

Framework still to be developed and approved by NERSA

Reconciliation of accounts - wheeling



- The purchaser of energy (the load) will receive a financial credit on its Eskom account for the net energy sent out by the Generator.
- A contract will have to be signed to facilitate the wheeling transaction. This will deal with the addition or subtraction of energy depending on the scenario
 - Will use the same meter data as measured at the generator
- This is loaded as a new service agreement on the main account.
- The cost of the energy bought directly from Eskom is paid at standard tariff rates (as per the supply agreement).
- An energy credit given to the purchaser (load) is at the Megaflex energy charges less losses and reliability service charge (the base rate) based on what the generator has allocated to the load
 - Losses and reliability services network costs are therefore charged on energy delivered at the standard tariff rates – as the credit excludes these costs
- The electrification and rural subsidy is payable on all delivered energy
- Network charges are payable on all energy delivered over Eskom's networks based utilised capacity and maximum demands
- The environmental levy charge is payable only Eskom owned energy.

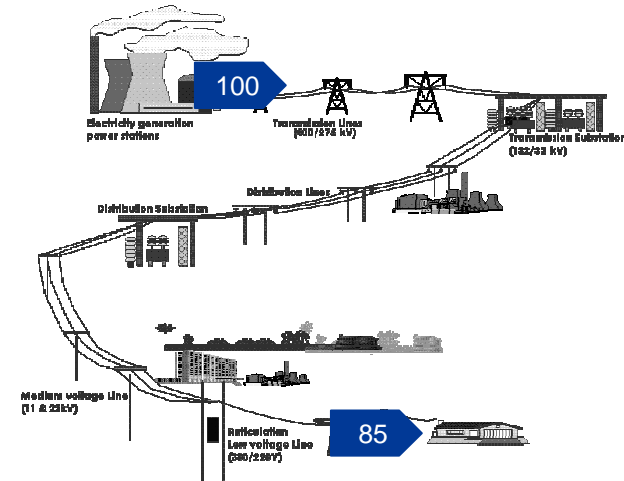
Treatment of costs of losses under wheeling



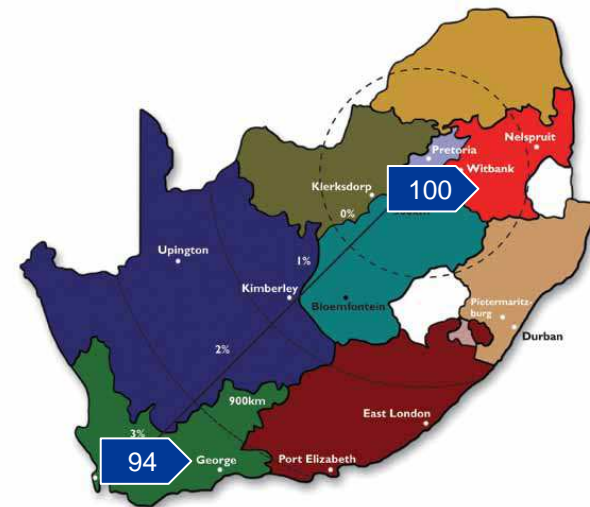
- Technical losses are a network related costs
- The load (purchaser) will pay for losses at the published loss factors for the energy wheeled
 - Eskom will not calculate the actual cost of losses from the generator to the load!
 - The load purchasing energy from a non-Eskom generator will not be treated differently from a load purchasing energy from Eskom.
- The charge for losses is currently bundled in the energy rates (not explicit)
- The energy wheeled will deducted on the bill at the Megaflex Eskom tariff rates (average cost) excluding losses and reliability services.
- The benefit or cost of losses due to the generator (as applicable) will accrue to the generator – not the load.

Explanation of losses

- The amount of energy produced by Eskom generation is higher than amount of energy sold to the end consumer. This is due to technical losses.
- Technical losses are a network related costs (to cover the difference between the amount produced and the amount sold)
- This cost needs to be recovered from all customers
- Actual losses per customer are not calculated – average loss factors are determined.
- Losses and loss factors are determined by voltage and the geographic location (Transmission Zone)
 - The lower the voltage the higher the losses (electricity has to travel greater distances)
 - The further away from Mpumalanga the greater the losses (the centre of generation capacity)
- Generation that connects to the Distribution network reduces Distribution losses
 - The benefit increases if generators connect further away from Mpumalanga and at lower voltages



Voltage differentiation



Geographic differentiation

Summary of wheeling charges payable

Generator	Load/purchaser
Pays use-of-system charges applicable to generators	Pays use-of-system charges applicable to loads
Use-of-system charges not linked to the wheeling arrangement	Use-of-system charges not linked to the wheeling arrangement
Losses benefit accrues to generator	Pays standard tariff loss factors
	Receives a financial credit for energy bought/received from generator
	Financial credit is calculated as: <ul style="list-style-type: none"> •The energy produced by the generator in P, S, O periods x Megaflex energy rates less losses and reliability services
	Load will pay subsidies on all energy delivered over the Eskom network

Example of a reconciliation



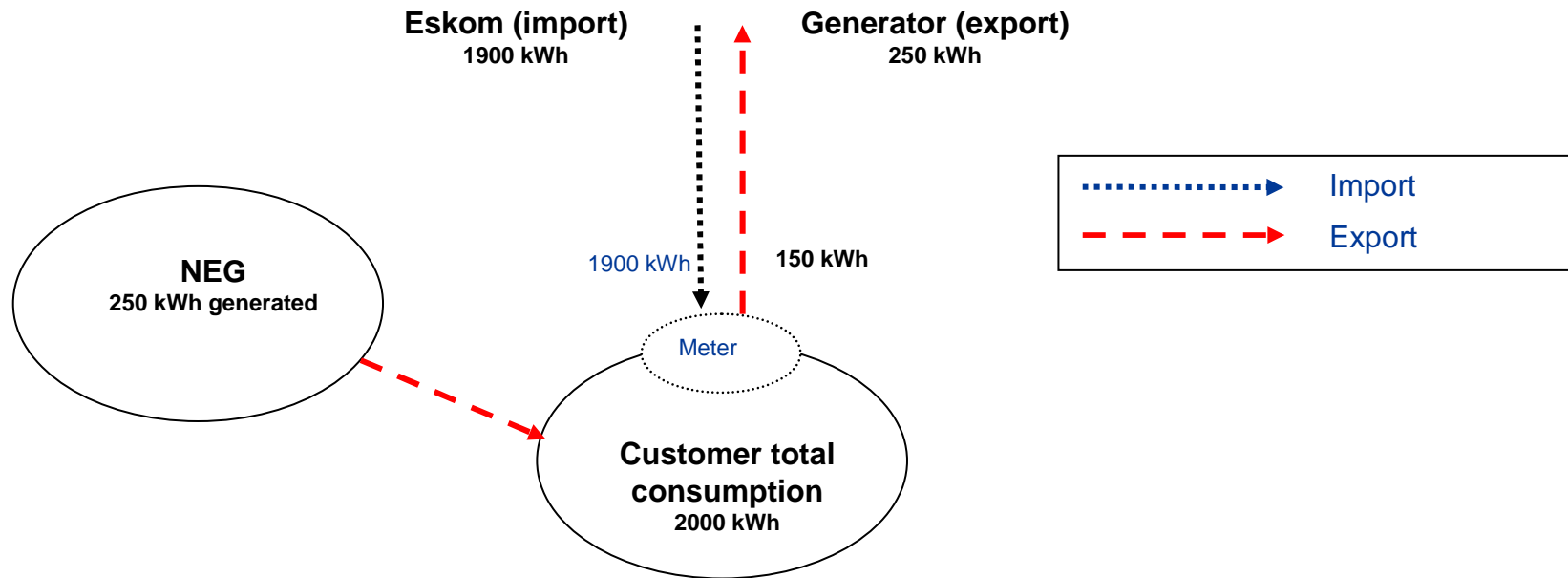
Where a customer on Megaflex purchases a portion of its energy from a NEG wheeled through Eskom's network

Example 1 (a) - Customer account reconciliation (High demand season)

Assumptions				Legend
- Notified maximum demand (kVA)		45,000		Lookups
- Maximum demand (kVA)		44,027		Inputs
- No. of days in billing month		30		Selection
- Supply voltage		> 132 kV		
- Transmission zone		> 600 km and ≤ 900 km		
- Munic		No		
- Size of supply		Key customers		
Calculations			High Demand Season	Charge
Network charges		kVA	R/kVA	
Transmission network charge		45,000	5.42	R 243,900
Distribution network access charge		45,000	0.00	R 0
Distribution network demand charge		44,027	14.28	R 628,706
A) Total network charges				R 872,606
Total energy through customer meter (High-demand season)		kWh	c/kWh	Charge
Peak consumption		4,824,703	173.44	R 8,367,965
Standard consumption		10,386,340	45.15	R 4,689,433
Off-Peak consumption		11,538,215	24.17	R 2,788,787
b₁) Sub-total		26,749,258	59.24	R 15,846,184
Adjustment for energy purchased from the NEG by the customer (-)				
<i>(@ Megaflex rates excluding losses and reliability services)</i>				
		kWh	c/kWh	(NEG energy)
Peak consumption		482,470	168.01	R 810,598
Standard consumption		1,038,634	43.43	R 451,079
Off-Peak consumption		1,153,822	23.05	R 265,956
b₂) Sub-total		2,674,926	57.11	R 1,527,633
B) (b₁-b₂) Net energy charge (may never be < 0)		24,074,332	59.48	R 14,318,551
		kvarh	c/kvarh	
Reactive energy charge		10,076	7.86	R 792
		kWh	c/kWh	
Electrification and rural subsidy (on all energy delivered)		26,749,258	3.97	R 1,061,946
Environmental Levy charge (on Eskom owned energy)		24,074,332	2.00	R 481,487
Service charge			R/day	R 63,129
Administration charge			R 67.20	R 2,016
C) Total other charges				R 1,609,369
Total excl VAT				R 16,800,525
VAT				R 2,352,074
D) Total account				R 19,152,599
Total cost of wheeling at standard tariffs exl VAT (annual average)				
Load factor associated with wheeled energy				80%
Demand associated with wheeled energy			kVA	2,785
Energy associated with wheeled energy			kWh	2,674,926
Network charges cost of wheeling				2.05
Average annual cost of losses and reliability services				2.94
Wheeling contribution to subsidies (c/kWh)				3.97
Total average annual cost of wheeling				8.96

- Generator produces for own use, but at times may be export energy onto the network
- Does not want to sell this energy to Eskom, but would like a credit on the account for the energy produced.

Offset of energy



- Generator supplies portion of its energy directly to its customer via its network.
- At times the generator exports surplus generated energy onto Eskom's network.
- Eskom does not buy this energy but a financial credit adjustment is given to the customer (in lieu of purchasing the energy) at the standard tariff rates in TOU period
- Typically Generator and customer same legal entity/company situated at same location.
- Credit adjustment at the contracted tariff energy rates in each TOU period, voltage level & Tx zone.
- Must be additional generation capacity installed by Generator and not more than 10% of load.
- Requires bi-directional metering

Offset example



Where NEG wheels energy at the same site as the load or a physical connection between load and generator (exports onto Eskom's network, and export is offset against load)

Example 2 - Customer account reconciliation (Megaflex example high demand season)

Assumptions				Legend
- Notified maximum demand (kVA)	45,000			Lookups
- Maximum demand (kVA)	44,027			Inputs
- No. of days in billing month	30			Selection
- Supply voltage	≥ 66kV & ≤ 132 kV			
- Transmission zone	> 300 km and ≤ 600 km			
- Munic	No			
- Size of supply	> 1 MVA			
Calculations		High Demand Season		Charge
Network charges	kVA	R/kVA		
Transmission network charge	45,000	4.22		R 189,900
Distribution network access charge	45,000	8.35		R 375,750
Distribution network demand charge	44,027	15.85		R 697,828
A) Total network charges				R 1,263,478
Total energy through customer meter (High-demand season)	kWh	c/kWh		Charge
Peak consumption	4,824,703	177.95		R 8,585,559
Standard consumption	10,386,340	46.29		R 4,807,837
Off-Peak consumption	11,538,215	24.77		R 2,858,016
b₁) Sub-total	26,749,258	60.75		R 16,251,412
Adjustment for energy offset from the NEG by the customer (-) (@ Tariff rates including losses and reliability services)	kWh	c/kWh		(NEG energy)
Peak consumption	482,470	177.95		R 858,556
Standard consumption	1,038,634	46.29		R 480,784
Off-Peak consumption	1,153,822	24.77		R 285,802
b₂) Sub-total	2,674,926	60.75		R 1,625,141
B) (b₁-b₂) Net energy charge (may never be < 0)	24,074,332	60.75		R 14,626,270
	kvarh	c/kvarh		
Reactive energy charge	10,076	7.86		R 792
	kWh	c/kWh		
Electrification and rural subsidy (on all energy delivered)	26,749,258	3.97		R 1,061,946
Environmental Levy charge (on net energy)	24,074,332	2.00		R 481,487
		R/day		
Service charge		R 2,104.29		R 63,129
Administration charge		R 67.20		R 2,016
C) Total other charges				R 1,609,369
Total excl VAT				R 17,499,117
VAT				R 2,449,876
D) Total account				R 19,948,994